UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/707,037	11/17/2003	Erica Murray	81044190/FMC1629PUS	1036

28395 7590 01/12/2007

BROOKS KUSHMAN P.C./FGTL
1000 TOWN CENTER
22ND FLOOR
SOUTHFIELD, MI 48075-1238

EXAMINER	
THOMPSON, MELISSA	
ART UNIT	PAPER NUMBER
1745	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/12/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/707,037	Applicant(s) MURRAY ET AL.	
	Examiner Melissa B. Thompson	Art Unit 1745	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 January 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-43* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-43* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *See Continuation Sheet*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :11/17/2003, 12/08/2003, 11/07/2005.

DETAILED ACTION

Information Disclosure Statement

The IDS filed November 7, 2005 is not proper because it does not include the PCT application number and the date of the search report.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1- 3, 12-14 , 22, 23, 26, 33, 35, 42, 43 are rejected under 35 U.S.C. 102(b) as being anticipated by Grieve (U.S. Publication Number 2002/0108308 A1).

Grieve discloses a solid oxide fuel cell (SOFC) comprised of an anode and a cathode with an electrolyte disposed therebetween (paragraph 7). The fuel cell stack also includes conduits to allow passage of the fuel and oxidant into the stack, and byproducts, as well as excess fuel and oxidant out of the stack (paragraph 8). Grieve discloses a SOFC can be used in conjunction with a reformer to convert a fuel to hydrogen and carbon monoxide usable by the fuel cell. Three types of reformers are used to convert hydrocarbon fuel to hydrogen using water, carbon dioxide, and oxygen with byproducts including carbon monoxide (paragraph 9). Grieve discloses to facilitate the reaction in SOFC, a direct supply of the fuel is preferred, however, concentrated supplies of these

fuels are generally less expensive and difficult to supply. Therefore, specific fuel can be supplied by processing a more complex source of that fuel. Grieve discloses that possible sources of fuel include dimethyl ether (paragraph 17). Grieve discloses fuel reforming can comprise mixing fuel with air, water and/or steam and converting a hydrocarbon or an oxygenated fuel in hydrogen and byproducts such as carbon monoxide and methane (paragraph 18).

3. Claims 33,35-43 are rejected under 35 U.S.C. 102(b) as being anticipated by Anzai et al. (U.S. Publication Number 2003/0060364 A1).

Anzai et al. disclose a process for producing a fuel gas for a fuel cell wherein the hydrocarbons and/or oxygen-containing hydrocarbons are converted to a reformed gas which is composed principally of hydrogen by an autothermal reforming reaction using such a catalyst (paragraph 2). Anzai et al. disclose that the feed stock for producing a reformed gas which is composed principally of hydrogen may be hydrocarbons and mixture thereof; specific examples include dimethyl ether (paragraph 53). In the process the feed stock hydrocarbons are converted to a reformed gas which is composed principally of hydrogen in the presence of the catalyst by an autothermal reforming reaction. Ta fuel gas for a fuel cell is generally supplied to a fuel cell stack by a process which is the combination of the desulfurization of the feed stock hydrocarbons prior to be subjected to an autothermal reforming treatment and the carbon monoxide conversion or carbon monoxide selective oxidation treatment of a reformed gas produced by an autothermal reforming (paragraph 54). Anzai et al. disclose the

oxygen to be introduced together with the feed stock is introduced in the reformer in such an amount that the O_2/carbon ratio is 0.1 to 0.5 and preferably 0.2 to 0.4 (paragraph 52), as defined in applicants' claim 4 and 5. Anzai et al. also teach that the reaction temperature is generally 200 to 800°C and preferably 300 to 600°C (paragraph 49).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 4-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grieve (U.S. Publication Number 2002/0108308 A1) in view of Anzai et al. (U.S. Publication Number 2003/0060364 A1).

The disclosure of Grieve as applied to claim 1 discussed above is incorporated herein. Grieve does not disclose the molar ratio the first mixture of molecular oxygen to a compound or the required temperature to heat the mixture.

Anzai et al. teach the oxygen to be introduced together with the feed stock is introduced in the reformer in such an amount that the O_2/carbon ratio is 0.1 to 0.5 and preferably 0.2 to 0.4 (paragraph 52), as defined in applicants' claim 4 and 5. Anzai et al. also teach that the reaction temperature is generally 200 to

800°C and preferably 300 to 600°C (paragraph 49), as defined in applicants' claims 6-9.

It would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the oxygen to carbon ratio. In the reformer reaction the base metal-based catalysts are relatively prone to cause carbon precipitation (paragraph 6). By optimizing the oxygen to carbon ratio, or making it a low ratio, prevents carbon precipitation. It also would have been obvious to one of ordinary skill in the art at the time of the invention to use the given temperature range because this is the general temperature of a reforming reaction as taught by Anzai (paragraph 49).

6. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grieve (U.S. Publication Number 2002/0108308 A1) in view of Kearl (U.S. Patent Number 6,677,070 B2).

The disclosure of Grieve as applied to claim 1 discussed above is incorporated herein. Grieve does not disclose the composition of the anode.

Kearl teaches the anode layer 18, comprises a material selected from the group consisting of nickel (Ni), Ni-yttria stabilized zirconia cermet (Ni-YSZ cermet), copper doped ceria, gadolinium doped ceria, strontium doped ceria, yttria doped ceria, Cu-YSZ cermet, Co-stabilized zirconia cermet, Ru-stabilized zirconia cermet, LSGM+nickel oxide, and mixtures thereof (column 6, lines 1-7).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the anode materials of Kearl in the anode of the solid oxide

fuel cell of Grieve because the anode materials taught by Kearl are conventionally used in SOFC for their ability to reform hydrocarbons and for their chemical and mechanical stability in a SOFC environment (column 2, lines 1-22).

7. Claims 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grieve (U.S. Publication Number 2002/0108308 A1) in view of Anzai et al. (U.S. Publication Number 2003/0060364 A1).

The disclosure of Grieve as applied to claim 14 discussed above is incorporated herein. Grieve does not disclose the molar ratio the first mixture of molecular oxygen to a compound or the required temperature to heat the mixture.

Anzai et al. teach the oxygen to be introduced together with the feed stock is introduce in such an amount that the O_2/carbon ratio is 0.1 to 0.5 and preferably 0.2 to 0.4 (paragraph 52), as defined in applicants' claim 15 and 16. Anzai et al. also teach that the reaction temperature is generally 200 to 800°C and preferably 300 to 600°C (paragraph 49), as defined in applicants' claims 17-20.

It would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the oxygen to carbon ratio. In the reformer reaction the base metal-based catalysts are relatively prone to cause carbon precipitation (paragraph 6). By optimizing the oxygen to carbon ratio, or making it a low ratio, prevents carbon precipitation. It also would have been obvious to one of ordinary skill in the art at the time of the invention to use the given temperature range

because this is the general temperature of a reforming reaction as taught by Anzai (paragraph 49).

8. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Grieve (U.S. Publication Number 2002/0108308 A1) in view of Anzai et al. (U.S. Publication Number 2003/0060364 A1) as applied to claim 20 above and further in view of Kearl (U.S. Patent Number 6,677,070 B2)

The disclosure of Grieve as applied to claim 20 discussed above is incorporated herein. Grieve does not disclose the claimed anode material.

Kearl teaches the anode layer 18, comprises a material selected from the group consisting of nickel (Ni), Ni-yttria stabilized zirconia cermet (Ni-YSZ cermet), copper doped ceria, gadolinium doped ceria, strontium doped ceria, yttria doped ceria, Cu-YSZ cermet, Co-stabilized zirconia cermet, Ru-stabilized zirconia cermet, LSGM+nickel oxide, and mixtures thereof (column 6, lines 1-7).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the anode materials of Kearl in the anode of the solid oxide fuel cell of Grieve because the anode materials taught by Kearl are conventionally used in SOFC for their ability to reform hydrocarbons and for their chemical and mechanical stability in a SOFC environment (column 2, lines 1-22).

9. Claims 24, 25, 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grieve (U.S. Publication Number 2002/0108308 A1) in view of Anzai et al. (U.S. Publication Number 2003/0060364 A1).

The disclosure of Grieve as applied to claim 22 discussed above is incorporated herein. Grieve does not disclose the molar ratio the first mixture of molecular oxygen to a compound or the required temperature to heat the mixture.

Anzai et al. teach the oxygen to be introduced together with the feed stock is introduce in such an amount that the O_2/carbon ratio is 0.1 to 0.5 and preferably 0.2 to 0.4 (paragraph 52), as defined in applicants' claim 24 and 25. Anzai et al. also teach that the reaction temperature is generally 200 to 800°C and preferably 300 to 600°C (paragraph 49), as defined in applicants' claims 27-20.

It would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the oxygen to carbon ratio. In the reformer reaction the base metal-based catalysts are relatively prone to cause carbon precipitation (paragraph 6). By optimizing the oxygen to carbon ratio, or making it a low ratio, prevents carbon precipitation. It also would have been obvious to one of ordinary skill in the art at the time of the invention to use the given temperature range because this is the general temperature of a reforming reaction as taught by Anzai (paragraph 49).

10. Claims 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grieve (U.S. Publication Number 2002/0108308 A1) in view of Kearl (U.S. Patent Number 6,677,707 B2).

The disclosure of Grieve as applied to claim 22 discussed above is incorporated herein. Grieve does not disclose the composition of the anode.

Kearl teaches the anode layer 18, comprises a material selected from the group consisting of nickel (Ni), Ni-yttria stabilized zirconia cermet (Ni-YSZ cermet), copper doped ceria, gadolinium doped ceria, strontium doped ceria, yttria doped ceria, Cu-YSZ cermet, Co-stabilized zirconia cermet, Ru-stabilized zirconia cermet, LSGM+nickel oxide, and mixtures thereof (column 6, lines 1-7).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the anode materials of Kearl in the anode of the solid oxide fuel cell of Grieve because the anode materials taught by Kearl are conventionally used in SOFC for their ability to reform hydrocarbons and for their chemical and mechanical stability in a SOFC environment (column 2, lines 1-22).

11. Claim 34 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Anzai et al. (U.S. Publication Number 2003/0060364 A1).

Anzai et al. disclose a process for producing a fuel gas for a fuel cell wherein the hydrocarbons and/or oxygen-containing hydrocarbons are converted to a reformed gas which is composed principally of hydrogen by an autothermal reforming reaction using such a catalyst (paragraph 2). Anzai et al. disclose that the feed stock for producing a reformed gas which is composed principally of hydrogen may be hydrocarbons and mixture thereof; specific examples include dimethyl ether (paragraph 53). In the process the feed stock hydrocarbons are

converted to a reformed gas which is composed principally of hydrogen in the presence of the catalyst by an autothermal reforming reaction. The fuel gas for a fuel cell is generally supplied to a fuel cell stack by a process which is the combination of the desulfurization of the feed stock hydrocarbons prior to be subjected to an autothermal reforming treatment and the carbon monoxide conversion or carbon monoxide selective oxidation treatment of a reformed gas produced by an autothermal reforming (paragraph 54). Anzai et al. disclose the oxygen to be introduced together with the feed stock is introduced in the reformer in such an amount that the O_2/carbon ratio is 0.1 to 0.5 and preferably 0.2 to 0.4 (paragraph 52), as defined in applicants' claim 4 and 5. Anzai et al. also teach that the reaction temperature is generally 200 to 800°C and preferably 300 to 600°C (paragraph 49), as defined in applicants' claims 38-41. It is inherent that with the given temperature and stoichiometric amounts that, the first mixture would produce, the amount of water and carbon dioxide would be less than about 10% by weight of the total weight of the second mixture.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Melissa B. Thompson whose telephone number is (571) 272-2758. The examiner can normally be reached on Monday through Friday from 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's Trainer, Susy Tsang-Foster can be reached on (571) 272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MBT

Susy Tsang-Foster

SUSY TSANG-FOSTER
PRIMARY EXAMINER